

CLAIMS

1. Treating solution for surface treatment of metal, which is aqueous surface treating solution to treat independently each metal material or simultaneously two or more metal materials selected from the group consisting of ferriferous material, zinciferous material, aluminiferous material and magnesiferous material, the treating solution containing 5 to 5000 ppm of at least one compound selected from the group consisting of zirconium compound and titanium compound calculated as metal element, and 0.1 to 100 ppm of free fluorine ion, and having pH 2 to 6.

2. The treating solution for surface treatment of metal according to claim 1, further containing at least one compound selected from the group consisting of calcium compound, magnesium compound and strontium compound, wherein concentration of the compound calculated as metal element is 5 to 100 ppm in the case of the calcium compound, 10 to 5000 ppm in the case of the magnesium and 10 to 5000 ppm in the case of the strontium compound.

3. The treating solution for surface treatment of metal according to claim 1 or 2, further containing 1000 to

50000 ppm of nitrate group.

4. The treating solution for surface treatment of metal according to any one of claims 1 to 3, further containing at least one oxygen acid and/or salt of oxygen acid selected from the group consisting of HClO_3 , HBrO_3 , HNO_2 , HNO_3 , HMnO_4 , HVO_3 , H_2O_2 , H_2WO_4 , H_2MoO_4 and salts thereof.

5. The treating solution for surface treatment of metal according to any one of claims 1 to 4, further containing at least one polymer compound selected from the group consisting of water soluble polymer compounds and water dispersible polymer compounds.

6. The treating solution for surface treatment of metal according to any one of claims 1 to 5, further containing at least one surface active agent selected from the group consisting of nonionic surface active agents, anionic surface active agents and cationic surface active agents.

7. A method for surface treatment of metal comprising, contacting independently each metal material or simultaneously two or more metal materials selected from

the group consisting of ferriferous material, zinciferous material, aluminiferous material and magnesiferous material with the treating solution for surface treatment according to any one of claims 1 to 6.

8. The method for surface treatment of metal according to claim 7, comprising, further contacting the metal material or the two or more metal materials with acidic aqueous solution of compound containing at least one element selected from the group consisting of cobalt, nickel, tin, copper, titanium and zirconium, after contacting with the treating solution for surface treatment, with or without washing by water.

9. The method for surface treatment of metal according to claim 7, comprising, further contacting the metal material or the two or more metal materials with treating solution containing at least one polymer compound selected from water soluble polymer compounds and water dispersible polymer compounds, after contacting with the treating solution for surface treatment, with or without washing by water.

10. A method for surface treatment of metal

comprising, electrolytic treating in the treating solution for surface treatment according to any one of claims 1 to 6, wherein independently each metal material or simultaneously two or more metal materials selected from the group consisting of ferriferous material, zinciferous material, aluminiferous material and magnesiferous material are a cathode.

11. The method for surface treatment of metal according to claim 10, comprising, further contacting the metal material or the two or more metal materials with acidic aqueous solution of compound containing at least one element selected from the group consisting of cobalt, nickel, tin, copper, titanium and zirconium, after electrolytic treating in the treating solution for surface treatment, with or without washing by water.

12. The method for surface treatment of metal according to claim 10, comprising, further contacting the metal material or the two or more metal materials with treating solution containing at least one polymer compound selected from water soluble polymer compounds and water dispersible polymer compounds, after electrolytic treating in the treating solution for surface treatment, with or

without washing by water.

13. A method for surface treatment of metal comprising, contacting independently each metal material or simultaneously two or more metal materials selected from the group consisting of ferriferous material, zinciferous material, aluminiferous material and magnesiferous material, whose surface is not degreased and cleaned with the treating solution for surface treatment according to claim 6.

14. A metal material having a surface treated film containing at least one metal element selected from the group consisting of titanium and zirconium formed on a surface of iron metal material by the method for surface treatment according to any one of claims 7 to 13, wherein an adhesion amount of the surface treated film calculated as the metal element is 30mg/m^2 or more.

15. A metal material having a surface treated film containing at least one metal element selected from the group consisting of titanium and zirconium formed on a surface of zinc metal material by the method for surface treatment according to any one of claims 7 to 13, wherein

an adhesion amount of the surface treated film calculated as the metal element is 20mg/m^2 or more.

16. A metal material having a surface treated film containing at least one metal element selected from the group consisting of titanium and zirconium formed on a surface of aluminum metal material by the method for surface treatment according to any one of claims 7 to 13, wherein an adhesion amount of the surface treated film calculated as the metal element is 10mg/m^2 or more.

17. A metal material having a surface treated film containing at least one metal element selected from the group consisting of titanium and zirconium formed on a surface of magnesium metal material by the method for surface treatment according to any one of claims 7 to 13, wherein an adhesion amount of the surface treated film calculated as the metal element is 10mg/m^2 or more.